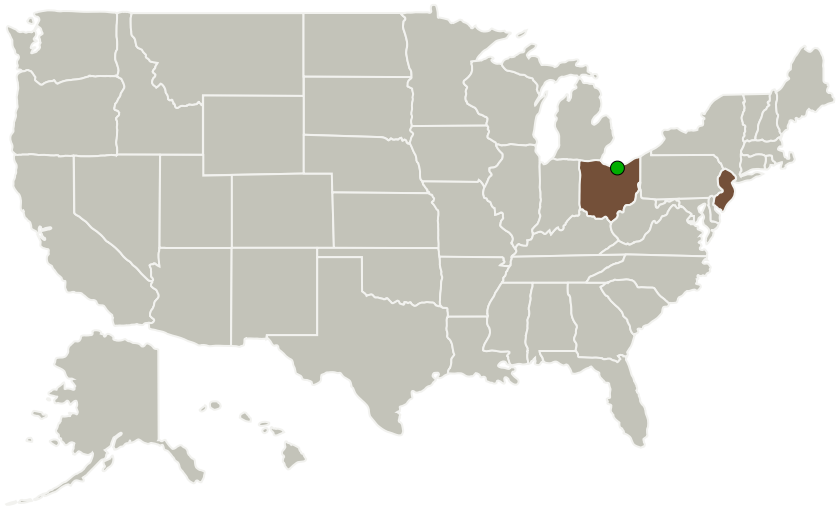
High-Efficiency, Nanowire Based Thermoelectric Devices for Radioisotope Power Conversion, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

This SBIR Phase I proposal responds to topic S3.03 of the 2010 NASA SBIR solicitation, for Power Generation and Conversion. Thermoelectric devices offer a simple and reliable means to convert radioisotope thermal energy into useable electrical power. Previously, thermoelectric devices based on bulk semiconductor materials have been limited by low conversion efficiencies, with Figure of Merit (ZT) values around 1.0 or less. Increasing ZT above 1.0 has thus far proved difficult, due to the fundamental limitation of identifying semiconductor materials with both a high electrical conductivity and low thermal conductivity. This SBIR project will develop high efficiency thermoelectric devices based on nanowires. The use of nanotechnology provides a means to circumvent previous limitations, and achieve combinations of properties not possible with bulk materials. Phase I will demonstrate technical feasibility by producing high efficiency thermoelectric devices based on nanowires. In Phase II, we will build and demonstrate prototype high efficiency thermoelectric devices. Phase II will also develop low cost manufacturing technology for the nanowire based thermoelectric devices, and demonstrate a technology readiness level of TRL 6.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Structured Materials Industries, Inc.	Lead Organization	Industry	Piscataway, New Jersey
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
New Jersey	Ohio

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138365)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Structured Materials Industries, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

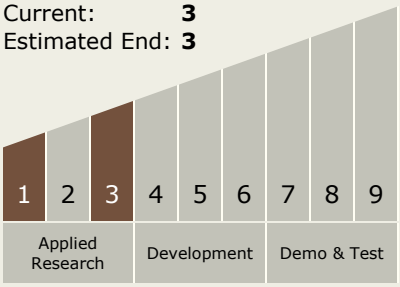
Carlos Torrez

Principal Investigator:

Nick Sbrockey

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System